

# Engineering Design File

## Hazard Classification of the Contained Test Facility at Test Area North

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## CONTENTS

ACRONYMS .....	3
1. INTRODUCTION .....	4
2. MATERIAL INVENTORY .....	5
2.1 Radionuclide Inventory for CTF .....	5
2.1.1 Radionuclide Inventory for CTF Buildings .....	5
2.1.2 Radionuclides for WMD Emergency Response Training .....	5
2.2 Hazardous Material Inventory .....	5
2.2.1 Hazardous Material Inventory for CTF Buildings .....	5
2.2.2 Hazardous Materials for WMD Emergency Response Training Exercises .....	7
3. HAZARD ASSESSMENT .....	8
3.1 Nuclear Categorization .....	8
3.1.1 Nuclear Categorization of CTF Buildings .....	8
3.1.2 Effect of Training Exercises on Nuclear Categorization of CTF .....	9
3.2 Hazardous Material Classification .....	9
3.2.1 Hazardous Material Classification of CTF Buildings .....	9
3.2.2 Effect of Training Exercise on Hazardous Material Classification of CTF .....	9
3.2.3 Summary of Classification .....	10
3.3 Other Hazards .....	10
4. CONCLUSIONS .....	14
5. REFERENCES .....	15

## TABLES

Table 2-1. Estimated radionuclide inventory in CTF-650 .....	5
Table 2-2. Radionuclides for the WMD First Response Team Training Activities. ....	5
Table 2-3. Chemical simulants for use in the WMD-CST training exercises. ....	7
Table 3-1. Comparison of estimated radionuclide inventory in CTF-650 to regulatory limits. ....	8
Table 3-2. Radionuclides for WMD-CST Training. ....	9
Table 3-3. NRASA Buildings at the CTF. ....	10
Table 3-4. TAN area CTF building and structures included in ASA-650 .....	11
Table 3-5. Criteria to determine if a facility/activity may be classified as NRASA. ....	12

## ACRONYMS

ANSI	American National Standards Institute
ASA	auditable safety analysis
CFR	Code of Federal Regulations
CTF	Contained Test Facility
D&D	decontamination and decommissioning
DOE	Department of Energy
DOE-ID	Department of Energy Idaho Operations Office
ERPG	Emergency Response Planning Guideline
GM	Geiger-Mueller counter
HAD	Hazard Assessment Document
ICMS	INEEL Chemical Management System
INEEL	Idaho National Engineering and Environmental Laboratory
IWTS	Integrated Waste Tracking System
LOFT	Loss-of-Fluid Test
MCA	multi-channel analyzer
MCP	management control procedure
NRASA	not requiring additional safety analysis
OSHA	Occupational Safety and Health Administration
PCB	polychlorinated biphenyl
PPE	personal protective equipment
RQ	reportable quantity
SAD	safety analysis document
SAR	Safety Analysis Report
SIH	standard industrial hazards
TAN	Test Area North
TNT	trinitrotoluene
TPQ	threshold planning quantity
TQ	threshold quantity
TQV	threshold quantity value
WMD	weapons of mass destruction

## 1. INTRODUCTION

This Engineering Design File (EDF) is to verify the classification for the Contained Test Facility (CTF) at Test Area North (TAN) located at the Idaho National Engineering and Environmental Laboratory (INEEL). CTF was originally classified as a low-hazard, radiological facility in ASA-650, "Interim Auditable Safety Analysis for the Contained Test Facility."<sup>1</sup>

## 2. MATERIAL INVENTORY

### 2.1 Radionuclide Inventory for CTF

#### 2.1.1 Radionuclide Inventory for CTF Buildings

Table 2-1 lists the estimated inventory of radionuclides as calculated in Reference 1., which are mainly in TAN-650, the old LOFT Containment Building.

Table 2-1. Estimated radionuclide inventory in CTF-650.

Nuclide <sup>a</sup>	Estimated Inventory (Ci) <sup>a</sup>
Cesium-137	9.0E-1
Cobalt-60	1.9E-2
Strontium-90	9.0E-1
Yttrium-90	9.0E-1

#### 2.1.2 Radionuclides for WMD Emergency Response Training

Table 2-2 lists the radionuclide sources that will be used in the WMD-CST training exercises and the expected source strength either in Ci or mrem/h.

Table 2-2. Radionuclides for the WMD First Response Team Training Activities.

	Radionuclide	Strength of Source
Various uranium ores	U-235/U-238	<1-30 mrem/hr
Commercially available products <sup>a</sup>		
Smoke detectors	Am-241	1 µCi
Fiesta ware dishes (Uranium glaze)	U-235/U-238	<1 to 20 mrem/h
Lantern mantles	Th-231	<1 mrem/h
Alarm clock	Radium	(<1 mrem/h
Exit signs	Tritium	<1 mrem/h
Gun sights	Tritium	<1 mrem/h
Various types of vaseline glass	Unknown	<1 to 10 mrem/h

a. Hazardous materials in commercially available products do not have to be included in a facility's inventory of releasable radionuclides.

## 2.2 Hazardous Material Inventory

#### 2.2.1 Hazardous Material Inventory for CTF Buildings

A search of the INEEL Chemical Management System (ICMS) indicates that there are no chemicals used or stored in the buildings associated with CTF. The ICMS is a database that contains a complete list of any chemicals brought into a facility. For example, all cleaning products appear in this database, and any hazardous materials in the cleaning products are identified. Hazardous materials in

cleaning products, however, are exempted from inclusion in the inventory for classifying a facility, because OSHA standards adequately address the use of these products.

Since the ICMS database does not include waste products, a search of the Integrated Waste Tracking System (IWTS) database was performed. The IWTS database indicates that TAN-624, which is the sheet-metal enclosure surrounding the Containment Building's large entrance door, is used to store TAN personnel protective equipment (PPE) and incinerable debris that is associated with the V-tanks. This implies that the debris is contaminated with polychlorinated biphenyls (PCBs), which per Table 302.4 in 40 CFR 302.4 has an RQ of 1 lb. In addition, there is trichloroethylene (TCE, RQ=100 lb), Mercury (Hg, RQ=1 lb), and small amounts of radiological contamination, which makes the waste stored in TAN-624 a mixed waste. The debris is contained in 51 55-gal drums with a total volume of 375 ft<sup>3</sup> (2,805 gal), two wooden containers with volumes of 100 ft<sup>3</sup> (748 gal) and 200 ft<sup>3</sup> (1,496 gal) and a fiber/plastic container with a volume of 5 ft<sup>3</sup> (40 gal). Since the actual amount of PCB, TCE, Hg, and radioactive contamination is unknown and considering the large volume of debris, a total of 680 ft<sup>3</sup> (5,089 gal) with a gross weight of 7,500 lb, it is likely and conservative to assume that the quantity of PCB in the containers exceeds 1 lb by itself.

The only other chemicals that will be brought into CTF will be cleaning products. While some cleaning products contain hazardous materials, the hazardous materials in cleaning products are not included in the releasable inventory for facility classification purposes, because OSHA standards adequately address the use of these products.

There is asbestos in many of the building at the CTF, so buildings that contain asbestos are posted to alert people to the presence of the asbestos.

## 2.2.2 Hazardous Materials for WMD Emergency Response Training Exercises

The hazardous material simulants that will be used in the training exercises are listed in Table 2-3.

Table 2-3. Chemical simulants for use in the WMD-CST training exercises.

Chemical Name	Synonyms	Chemical Abstract Service No. (CAS#)	Listed in	
			40 CFR 302.4 RQ (lb)	40 CFR 355 TPQ (lb)
Chemical Simulants Including Organic Chemicals				
Triethyl Phosphate	Ethyl Phosphate, TEP, Phosphoric Acid, Triethyl Ester	78-40-0	No	No
Phenyl Phosphate Disodium Salt	None listed	3279-54-7	No	No
Methyl Salicylate	o-anisic acid; benzoic acid, 2-hydroxy-, methyl ester; betula; betula oil; exagien; flucarmit; gaultheria oil, artificial; gaultheria oil; o-hydroxybenzoic acid, methyl ester; 2-hydroxybenzoic acid methyl ester; methylester kyseliny salicylove (Czech); methyl o-hydroxybenzoate; natural wintergreen oil; oil of wintergreen; synthetic wintergreen oil; teaberry oil; wintergreen oil; wintergreen oil, synthetic	119-36-8	No	No
Levan <sup>1</sup>	None listed	9013-95-0	No	No
Diethyl Malonate	None listed	105-53-3	No	No
Iron (III) Nitrate, nonahydrate	Ferric Nitrate, Nonagydrate; Nitric Acid (3+) Salt Nonahydrate	7782-61-8-1	No	No
Pesticides				
Carbaryl	Sevin; 1-Naphthalenol, Methylcarbamate	63-25-2	Yes (100 lb)	No
Diazinon	None listed	333-41-5	Yes (1 lb)	No
Malathion	Cythion	121-75-5	Yes (100 lb)	No
Endosulfan	Thiodan; Thiogard; 6,9-Methano-2,4,3-Benzodioxathiepin, 1,6,7,8,9,10,10-Hexachloro-1,5,5a,6,9,9a-Hexahydro-, 3-Oxide	115-29-7	Yes (1 lb)	Yes (10 lb)
Dicofol	Kelthane	115-32-2	Yes (10 lb)	No
Other				
Glo Germ gel <sup>2</sup>	None listed	None	No	No
Glo Germ liquid <sup>2</sup>	None listed	None	No	No
Glo Germ powder <sup>2</sup>	None listed	None	No	No
1. Sigma Chemical Company, according to their literature, is not aware of any hazards for Levan (it is a sugar polymer)				
2. This material is basically ground up plastic that is sensitive to black light (ultraviolet) and is used to simulate the spread of contamination and how the contamination can be detected				

### 3. HAZARD ASSESSMENT

#### 3.1 Nuclear Categorization

##### 3.1.1 Nuclear Categorization of CTF Buildings

As a DOE Category A reactor, LOFT was categorized as a high-hazard, nuclear facility. After the LOFT reactor was removed, the facility was reclassified as a low-hazard, nonnuclear facility in its SAR,<sup>2</sup> in accordance with DOE Order 5481.1A. Subsequently, this DOE order has been canceled and replaced by DOE-ID Order 420.D. Based on the new DOE-ID order, the classification of the CTF is as follows:

Department of Energy Order 5480.23<sup>3</sup> provides for hazard categorization of a nuclear facility. DOE-STD-1027-92<sup>4</sup> contains radionuclide threshold quantity values (TQVs) to determine which categorization level the nuclear hazard represents. Facilities whose releasable radioactive material inventory is less than the Category 3 TQV limits of DOE-STD-1027-92 are not nuclear facilities and are exempt from the requirements of DOE Order 5480.23 for safety analysis. To begin the process, the radionuclide inventory remaining at CTF was compared to the Category 3 TQVs (See Table 2-1). This comparison demonstrates that the sum of the ratios for the residual radioactive materials in TAN-650 are less than 1 for the Category 3 TQVs, so CTF is a nonnuclear facility.

Table 3-1. Comparison of estimated radionuclide inventory in CTF-650 to regulatory limits.

Nuclide <sup>a</sup>	Estimated Inventory (Ci) <sup>a</sup>	Category 3 Threshold Quantity Value (Ci)	Ratio
Cesium-137	9.0E-1	6.0E+1	1.5E-2
Cobalt-60	1.9E-2	2.8E+2	6.8E-5
Strontium-90	9.0E-1	1.6E+1	5.6E-2
Yttrium-90	9.0E-1	1.42E+3	6.3E-4
Sum of the Ratios <sup>b</sup>			7.1E-2

a. Estimated radioactive material inventory is developed in Reference 1.  
b. Per Reference 4, the sum of the ratios must be less than one for a facility to be categorized as a nonnuclear facility.

### 3.1.2 Effect of Training Exercises on Nuclear Categorization of CTF

Table 3-2 lists the radionuclides that may be used in the training exercises and the Category 3 TQVs and radiological facility RQs from Appendix B of 40 CFR 304.4. The quantities that will be used for training are orders of magnitude less than that required for a Category 3 nuclear facility, so there will be no effect on the categorization of CTF.

Table 3-2. Radionuclides for WMD-CST Training.

Radionuclide	Category 3 TQV (Ci)
Various uranium ores (<1-30 mrem/h)	4.2
Commercially available products <sup>a</sup>	
Smoke Detectors (Am-241, 1 $\mu$ Ci)	0.52
Fiesta Ware dishes (Uranium glaze, <1 to 20 mrem/h)	4.2
Lantern Mantles w/ Th-231 (<1 mrem/h)	12,000
Alarm Clock w/Radium (<1 mrem/h)	12 <sup>b</sup>
Exit signs w/Tritium (<1 mrem/h)	16,600 <sup>d</sup>
Gun sights w/Tritium (<1 mrem/h)	16,600 <sup>d</sup>
Various types of Vaseline glass ranging from <1-10 mrem/h	NA
<p>a. Hazardous materials in commercially available products do not have to be included in a nuclear facility's inventory of releasable radionuclides per Reference 4.</p> <p>b. Lowest TQV for all isotopes.</p> <p>c. It takes 4,630 gm of U-235 and 29,760 gm of U-238 to have 0.01 Ci of uranium. This is based on 2.16E-06 Ci/gm for U-235 and 3.36E-07 Ci/gm for U-238.<sup>5</sup> Note, natural uranium is 99.3% U-238, and the calculation is for uranium metal, which does not include the rock overburden.</p> <p>d. From Reference 5 a gram of tritium has 9650 Ci of radiation. Tritium is a beta emitter with no gamma.</p>	

## 3.2 Hazardous Material Classification

### 3.2.1 Hazardous Material Classification of CTF Buildings

As noted in Section 2.2.1, there could be over a pound of PCBs in TAN-624 and the RQ from Table 302.4 of 40 CFR 302.4 is 1 lb for PCBs. Although the amount of Hg, TCE, and radioactive contamination is unknown, it will not affect the classification of TAN-624, because the sum of the ratios is over 1.0 for PCB alone. The amount of radioactive contamination in the waste is small enough that the categorization of CTF as a nonnuclear facility will not be affected. Even though other CTF buildings do not contain hazardous materials, CTF as a whole is a low-hazard, nonnuclear facility.

### 3.2.2 Effect of Training Exercise on Hazardous Material Classification of CTF

The only hazardous material that will be used as a simulant for the training exercises is Endosulfan, which has a Threshold Planning Quantity (TPQ) of 10 lbm in 40 CFR 355. Exceeding this quantity would make CTF a moderate-hazard, nonnuclear facility. The amounts that will be used in the training exercise, however, will be orders of magnitude lower than the TPQ, so Endosulfan will not affect the classification of CTF.

### 3.2.3 Summary of Classification

The required safety analysis for a low-hazard, nonnuclear facility is an auditable safety analysis. Since there has been no change in the facility's inventory of radionuclides and hazardous materials, and sampling operations have not been performed to determine the exact inventory of radioactive and hazardous materials, the facility as a whole will remain a low-hazard, nonnuclear facility.

The asbestos contained in buildings at the CTF does not pose a danger, since it is managed in accordance with 29 CFR 1910.1001 and 29 CFR 1926.1101, and access and exposure to asbestos is controlled in accordance with the INEEL Asbestos Management Program.<sup>6</sup>

## 3.3 Other Hazards

The fact that this classification is based on only two of the buildings in the CTF area, means that the only hazards remaining to be evaluated in the other buildings are not related to radiological or hazardous material considerations, and that all other facilities may be classified as NRASA. Hazard Assessment Document, HAD-107, "TAN Area Contained Test Facility Non-Nuclear Facilities Facility Hazard Classification,"<sup>7</sup> has identified the buildings listed in Table 3-3 as NRASA.

Table 3-3. NRASA Buildings at the CTF.

Building No.	Facility
631	Tank Building (CTF)
635	HV-10 South Continuous Air Monitor Building (CTF)
637	Compressor (CTF)
651	Heat Stress Relief Structure
657	Heat Stress Relief Structure
663	H&V 10 (North CAM) Continuous Air Monitoring Building (CTF)
671	Office Trailer North (CTF)
672	Office Trailer South (CTF)
703	Exhaust Stack (CTF)
716	Exhaust Duct and Stack (CTF)
719	Shielded Roadway to TAN-630 (CTF)
744	Inlet Gas Supply Platform (CTF Area)
746	Condenser Shelter Structure (CTF)
749	Solar Collector Support (CTF)
767A	Boiler Fuel Tank (FO-T-13A) (CTF)
767B	Boiler Fuel Tank (FO-T-13B) (CTF)
773	Concrete Water Storage Tank (CTF)
774	Concrete Slab (CTF)

TAN-650 does not contain enough radionuclides to categorize CTF as a Category 3 nuclear facility, and TAN-624 contains enough hazardous material to classify CTF as a low-hazard facility. However, the remaining facilities listed in Table 3-4 need to be classified.

Table 3-4. TAN area CTF building and structures included in ASA-650.

Building No.	Facility
630	Control and Equipment Building (CTF)
659	Control Shelter (CTF)
725	Vault Exhaust Stack (CTF)
726	Hot Liquid Waste Storage Tanks/Vault (CTF)
736	Septic Tank (CTF)
737	Septic Tank (CTF)
745	Secondary Coolant System Heating System (CTF)
750	Liquid Waste Disposal Pond (CTF Area)
765	Slop Tank (Tank No. 114)
768	South Electrical Substation
771	Sulfuric Acid Tank (CTF)

To address the classification of the remaining buildings, Table 4-5 lists additional hazards that must be addressed in the classification of the remaining CTF buildings. The only other hazards present at CTF that are not discussed above are the standard industrial hazards. These hazards include common everyday obstacles and hazards (such as walking surfaces, stairs, some combustible materials, and electrical power). These hazards are adequately addressed in applicable Occupational Safety and Health Administration (OSHA) standards and implemented by the INEEL Safety and Health Manual (Manuals 14A and 14B).

Table 3-5. Criteria to determine if a facility/activity may be classified as NRASA.

Hazard Type	Applicable to CTF?	Criteria or Limit	Criteria Meet by CTF?
1. Radioactive material	Yes	Inventory is less than that of a Category 3 nuclear facility	Yes (TAN-650 & -624 only)
2. Chemical hazards	Yes	The MAR quantity less than RQ in 40 CFR 302 for a low-hazard facility	No (TAN-624 only)
3. Standard industrial hazards (SIHs)	Yes	Controlled in compliance with applicable OSHA regulations: Walking and working surfaces Noise Electrical power (as limited below) Flammable materials (as limited below) Machinery (as limited to kinetic energy below) Laboratory quantities of hazardous chemicals (as limited above) Lifting equipment Office areas High temperature (as limited below) Welding Materials listed in 29 CFR 1910 Subpart Z	Yes
4. Nuclear criticality hazard	No	The inventory of fissionable material is less than 15 g for U-233, U-235, Pu-239, and Pu-241 (with the exception of natural and depleted uranium)	NA
5. Field and low-level fixed x-ray equipment	No	The field and low level x-ray equipment meets American National Standards Institute (ANSI) x-ray standards, and the dose from a single event does not exceed 2 rem	NA
6. Toxic materials	No	Potential air concentrations less than Emergency Response Planning Guideline (ERPG)-1 limit or its equivalent at 100 m for substances exceeding 5 times the RQ values of 40 CFR 302	NA
7. Flammable materials	Yes	Inventory of flammable materials is less than allowed by National Fire Protection Association code for the building occupancy classification.	Yes
8. Explosive materials	No	Inventory of explosive materials less than allowed by uniform fire code for the building occupancy classification, or as established in writing between operations line management and the INEEL Explosives Safety Committee, or by DOE Manual 440.1.1.	Yes
9. Lasers	No	The laser is an ANSI Z136.1 Class I or II or Class III with an enclosed beam.	NA
10. Electrical	Yes	Electrical sources <600 V or if >600 V amperage is <25 mA and <50 J of stored energy.	Yes
11. Kinetic energy	No	There are no unusual or unique high kinetic energy systems.	NA
12. Pressure	No	The pressure stored energy is no more than 0.1 lb trinitrotoluene (TNT) equivalent if the pressure is more than 3,000 psig.	NA
13. High temperature	No	Temperature is incapable of environmental interaction to cause strong overpressure, toxic products, or to initiate a release of hazardous materials	NA
14. Biohazards	No	There are no special industrial hygiene controls required, based on review by the Institutional Biosafety Committee (such as hanta virus)	NA

As shown in Table 4-5, all facilities buildings in the CTF area, except TAN-624, meet the requirements for NRASA. While these buildings could be considered NRASA, there will be more flexibility for operating personnel if the low-hazard, nonnuclear facility remains in effect for all CTF buildings. Larger quantities of radionuclides and hazardous chemicals can be brought into the buildings, as long as the sum of the ratios for radionuclides does not exceed 1 when compared to the Category 3 TQVs listed in Reference 4, or any one chemical does not exceed the threshold quantity (TQ) in

431.02  
01/30/2003  
Rev. 11

**ENGINEERING DESIGN FILE**

EDF- 3752  
Rev. No. 0  
Page 13 of 15

29 CFR 1910.119 or the threshold planning quantity (TPQ) in 40 CFR 355. Note, for the two CFRs the sum of the ratios is not used.

## 4. CONCLUSIONS

The CTF Containment Building (TAN-650) does not contain enough radionuclides to classify the building as a Category 3 nuclear facility, but TAN-624, which is attached to TAN-650, contains enough PCBs, TCE, Hg, and radionuclides to classify the building as a low-hazard, nonnuclear facility. Therefore, CTF is a low-hazard, nonnuclear facility and will remain as such until sampling operations can be performed to quantify the radionuclide inventory and the waste drums are removed. As noted in Section 3.3, all CTF buildings, except TAN-624 and TAN-650, are NRASA, but their classification will remain as a low-hazard, nonnuclear facility to provide operational flexibility.

The small amounts of radioactive contamination found outside of the containment building (TAN-650) are posted with a warning sign that lists the dose rate, and access to and exposure from the contaminated areas is controlled in accordance with the INEEL Radiation Protection Program, which adequately protects the public, facility workers, and environment.

The small amount of radionuclides that will be used for training purposes do not affect the classification of the CTF, since most of it is in commercially available products.

The asbestos contained in buildings at CTF does not pose a danger, since it is managed in accordance with 29 CFR 1910.1001 and 29 CFR 1926.1101 with access and exposure to asbestos controlled in accordance with the INEEL Asbestos Management Program.<sup>6</sup>

## 5. REFERENCES

1. ASA-650, "Interim Auditable Safety Analysis for the Contained Test Facility," Revision 0, October 2000.
2. INEEL, Safety Analysis for the Contained Test Facility (CTF), Rev. 1, February 18, 1987.
3. U. S. Department of Energy, DOE Order 5480.23, "Nuclear Safety Analysis Report," April 30, 1992.
4. DOE-STD-1027-92, "Hazard Categorization and Accident Analysis Techniques for Compliance with DOE Order 5480.23, Nuclear Safety Analysis Reports," Change Notice No. 1, September 1997.
5. Los Alamos National Laboratory, Table of DOE-STD-1027-92 Hazard Category 3 Threshold Quantities for the ICRP-30 List of 757 Radionuclides, LA-12981-MS, UC-940, August 1995.
6. MCP-2862, "Asbestos Management Program Administration," Rev. 2, June 25, 2002.
7. HAD-107, "TAN Area Contained Test Facility Non-Nuclear Facilities Facility Hazard Classification," Rev. 0, October 10, 2000.